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DETERMINATION OF THE COSMIC RAY EQUATOR

ON THE 14°W MERIDIAN

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The Störmer theory on the effect of the Earth's magnetic field upon the trajectory of primary cosmic rays remained during quite some time without substantial variations. According to that theory, the cosmic ray intensity minimum (cosmic ray equator) [1]. must be situated in the geomagnetic equator region. The works by Simpson [2, 3] have shown that notable discrepancies exist between theory and the results of measurements conducted with the aid of neutron monitors. According to these measurement data the position of the cosmic ray equator differs at certain points of the terrestrial surface by more than 10 from the position of the geomagnetic equator. Subsequent measurements [4 — 10] corroborated these conclusions. Currently it is well known that the cosmic ray equator coincides satisfactorily with the zero isocline epoch of 1955, and is not shifted during the periods of notable decreases of cosmic ray intensity.

Measurements of cosmic ray intensity were effected by us during the sailing of the ship "COOPERATION" to the Antarctica. They were made with the aim of determining the position of the effective equator in the Atlantic Ocean region, coinciding with the period of low solar activity; in this regard they differed from most of the previous measurements, conducted during the years of solar activity maximum.

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* OPREDELENIYE EKVATORA KOSMICHESKIKH LUCHEY NA MERIDIANE 14°W.

The total ionizing component of cosmic radiation was registered with the help of a counter telescope, consisting of two series of Geiger counters, 50 cm apart. Each series consisted of 39 counters with a total effective surface of 0.9 m². The device provided 6000 dyal coincidences per minute. Each group of five counters had its own quenching circuit.

Output data of registering devices were fed every minute to a computer that recorded them on a paper. The device was built at Tesla Liberec factory for measurement of radioactivity and was adapted to our requirements.

In order to reach a satisfactory statistical precision, it was sufficient to conduct measurements at 10-minute intervals. They were conducted several times per day in the $30°$N to $20°$S latitude range. The path of the ship is schematically represented in Fig.1, the part of it corresponding to data utilized in this work being outlined.
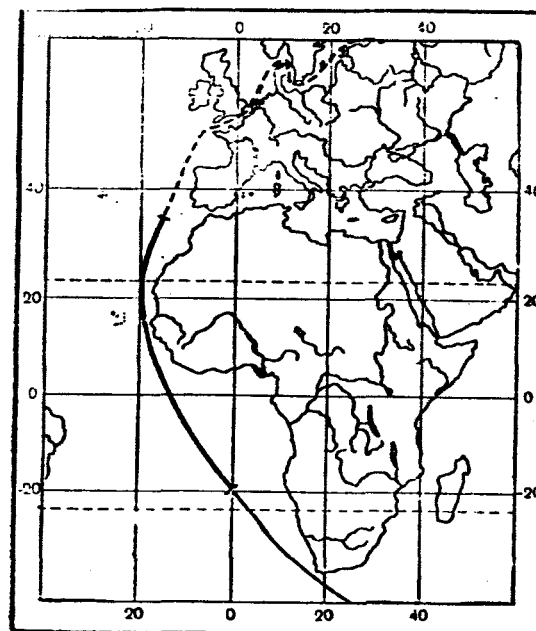
Corrections for the barometric effect were made in the measurement data, and

Fig. 1

the barometric factor utilized was the one determined for analogus Elliot devices [11]. When investigating the latitude effect by the method of least squares, we determined the parabola parameters

$$I = a + b\varphi + c\varphi^2,$$

describing rge dependence of cosmic ray intensity I on the geographical latitude φ. The position of the cosmic ray equator was found from the correlation $\varphi_c = -b/2c$ (Fig.2).

The value $\varphi_0 = 7.8°N$, found from the measurement data, agrees well with the results obtained in reference [10], and with the position of the geomagnetic equator computed taking into account the non-dipole terms of the Earth's magnetic field, [12].

The introduction of corrections for the world variations in cosmic ray intensity, by using registration data in Prague did not affect the result obtained. This may be explained by the fact that no notable changes occurred in the intensity of cosmic rays between the 11th and 30th December 1961, when measurements of latitude effect took place.

The utilization at analysis of the function

$$I = \sum_0^n a_n \varphi^n \quad (n = 1, 2, 3)$$

also hardly affected the result.

Fig. 2

Hence it follows, that the position of the equator of cosmic rays does not vary during lengthy periods and remains constant in the course of a solar activity cycle (although notable variations of the latitude effect curve in the $\sim 50°$ latitude region are observed at that time).

The authors are grateful to the commander of "Cooperation" for assistance in conducting measurements, and a;so to K. Yavornitskiy, I. Gladkiy and I. Legraus for their help in remodeling the device.
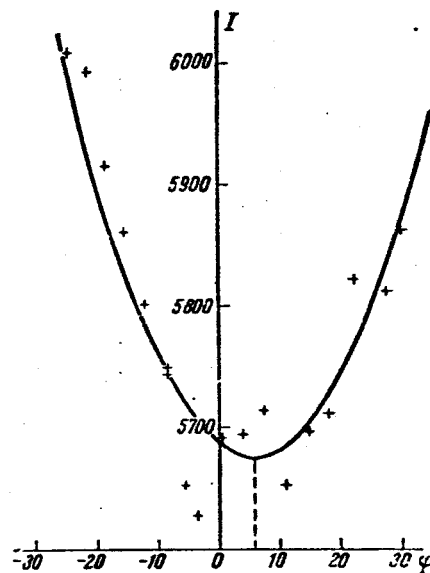
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